

60/151403

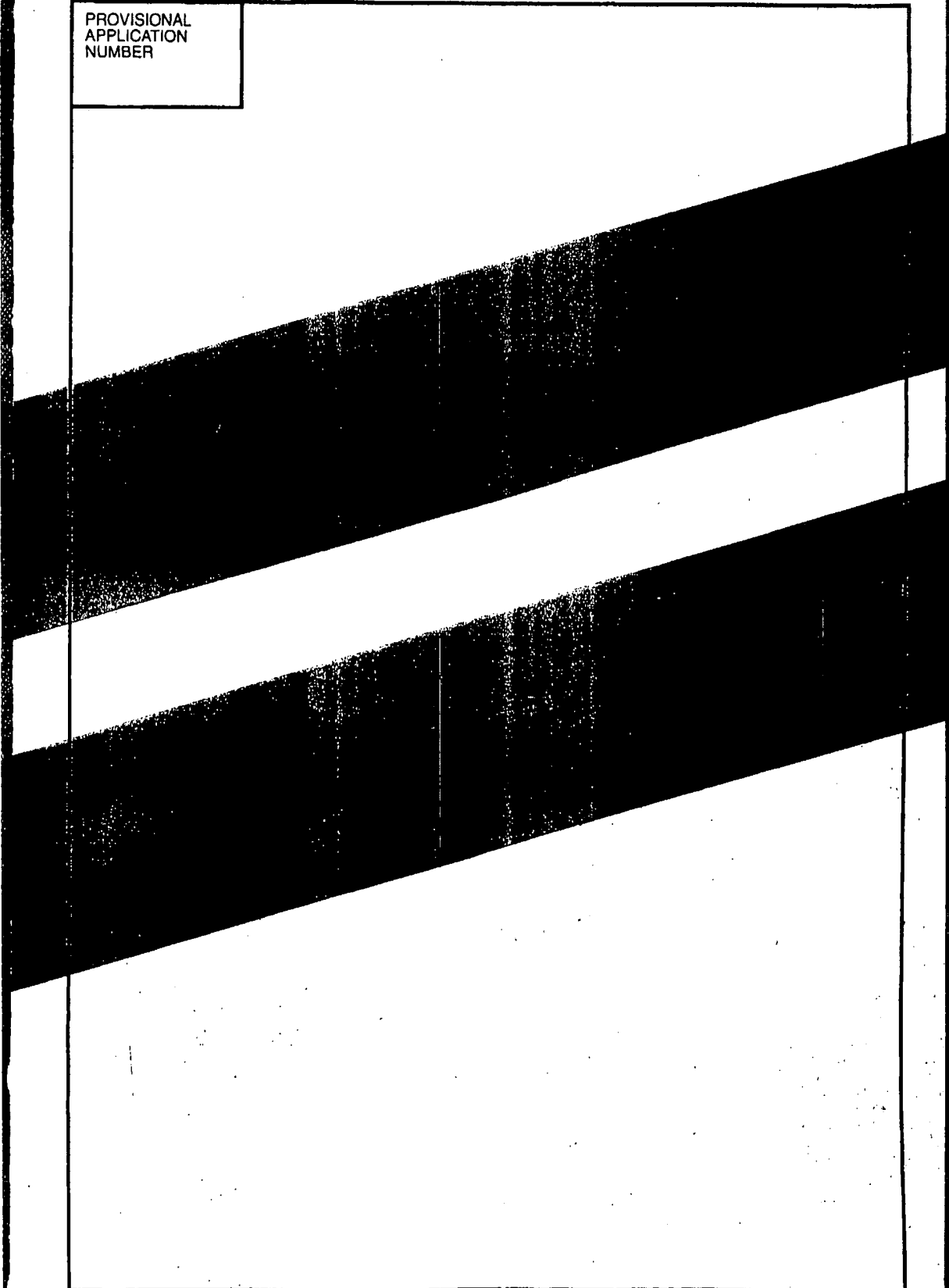


	Subclass
	Class

ISSUE CLASSIFICATION  
**SCANNED: 6**



PROVISIONAL  
APPLICATION  
NUMBER



SCANNED 6 TW

PATENT APPLICATION



60151483

Received  
or  
Mailed

Application \_\_\_\_\_ papers.

2. *Request for Claim*

3. *Response*

4.

11.

12.

13.

14.

15.

16.

17.

18.

19.

20.

21.

22.

23.

24.

25.

26.

27.

28.

29.

30.

31.

32.

PATENT APPLICATION SERIAL NO. \_\_\_\_\_

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET

PTO-1556  
(5/87)

\*U.S. GPO: 1998-433-214/80404

09/03/1999 CCE:IN 00000058 60151483  
01 FC:114 150.00 CP

SERIAL NUMBER 60/151,483 PROVISIONAL		FILING DATE 08/30/99	CLASS	GROUP ART UNIT 0000	ATTORNEY DOCKET NO. P-68392/DJB/	
APPLICANT	TODD DICKINSON, SAN DIEGO, CA.					
	<b>**CONTINUING DOMESTIC DATA*****</b> VERIFIED  					
	<b>**371 (NAT'L STAGE) DATA*****</b> VERIFIED  					
	<b>**FOREIGN APPLICATIONS*****</b> VERIFIED  					
Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance Verified and Acknowledged <u>Examiner's Initials</u> <u>Initials</u>		STATE OR COUNTRY CA	SHEETS DRAWING 2	TOTAL CLAIMS	INDEPENDENT CLAIMS	
ADDRESS	ROBIN M SILVA FLEHR HOHBACH ALBRITTON & HERVERT LLP 4 EMBARCADERO CENTER SUITE 3400 SAN FRANCISCO CA 94111					
	METHOD FOR IMPROVING SIGNAL DETECTION FROM MICROARRAYS					
TITLE						
FILING FEE RECEIVED  \$150		FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT NO. _____ for the following:			<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit	

1c674 U.S. PTO  
08/30/99

# PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(c)

"EXPRESS MAIL" MAILING LABEL Number 6124321844018, Date of Deposit August 30, 1999  
I hereby certify that this paper or fee and listed enclosures is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 57 C.F.R. 1.10 on the date indicated above and is addressed to Box Provisional Patent Applications, Assistant Commissioner for Patents, Washington, D.C. 20231, on August 30, 1999.  
Typed or Printed Name: Arnold Rick

Signed: Arnold Rick

Docket Number:

P-68392/DJB/RMS

Type a plus sign (+)  
inside this box --

+

## INVENTOR(S)/APPLICANT(S)

LAST NAME	FIRST NAME	MIDDLE INITIAL	RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)
DICKINSON	Todd		San Diego, California

## TITLE OF THE INVENTION (280 characters max)

METHOD FOR IMPROVING SIGNAL DETECTION FROM MICROARRAYS

## CORRESPONDENCE ADDRESS

ROBIN M. SILVA

FLEHR HOHBACH TEST ALBRITTON & HERBERT LLP, 4 Embarcadero Center, Suite 3400, San Francisco

STATE	CA	ZIP CODE	94111	COUNTRY	US
-------	----	----------	-------	---------	----

## ENCLOSED APPLICATION PARTS (check all that apply)

<input checked="" type="checkbox"/>	Specification	Number of Pages	5	<input type="checkbox"/>	Small Entity Statement
<input type="checkbox"/>	Drawings	Number of Sheets	<input type="checkbox"/>	<input type="checkbox"/>	Other (specify):

## METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)

<input checked="" type="checkbox"/>	A check (No. <u>25756</u> ) or money order is enclosed to cover the Provisional filing fees	PROVISIONAL FILING FEE AMOUNT	\$150
<input type="checkbox"/>	The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number: <u>06-1300 (OrderNo. P-68392/DJB/RMS)</u>	\$150.00	

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

Yes, the name of the U.S. Government Agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted,

SIGNATURE:

Robin M. Silva

Date

August 30, 1999

TYPED or PRINTED NAME Robin M. Silva

REGISTRATION NO.  
(if appropriate)

38,304

Additional inventors are being named on separately numbered sheets attached hereto.

## USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Burden Hour Statement: This form is estimated to take .2 hours to complete. Times will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Assistant Commissioner for Patents, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

0071

### INVENTION DISCLOSURE FORM

This form is provided to permit evaluation of the patent potential of company inventions, and to facilitate preparation of patent applications when warranted. Please fill in each space as completely as possible, and use additional sheets when necessary.

1. Name: Todd Dickinson
2. Date:
3. State the Title of the Invention: Method for Improving Signal Detection from Microarrays
4. Describe the invention: Use additional sheets if necessary. Attach descriptive materials such as drawings, sketches, photographs, etc. which may help illustrate the invention. Delineate new and important features. Make sure to include both the preferred embodiment as presently identified, and alternative constructions, procedures or equivalent components which can accomplish the same result as the preferred embodiment.

The ability for any analytical system, optical or otherwise, to detect a change in signal is dictated by the background and noise associated with that signal. Exploring different ways to improve the signal to background ratio by either amplifying the signal, reducing the background, or both, is thus a critical area of research during the development of any type of analytical detection system.

One of the primary sources of background in optical microarray systems is the intrinsic fluorescence of the array substrate. In the present Illumina array configuration, the fluorescence of microspheres immobilized at the distal tip of the imaging fiber bundle is imaged from the proximal end of the bundle. While this approach has a number of advantages, most importantly being the remote sensing capability and the ease of sample interface, the background of the measurement will necessarily include any fluorescence originating from the fiber core glass itself. Since each fiber element is its own waveguide, it is particularly susceptible to generating high fluorescence readings on the detector since the fluorescence of the glass constituents as well as any contaminants present at the core-clad interface will be captured and propagated down the fiber and measured by the detector. Conversely, if one turns the fiber around and images the bead array directly, the background is found to be slightly reduced (most likely due to the fact that the focal plane is no longer placed on the glass itself, but rather on the beads in the wells, and thus collection of core fluorescence is not as efficient). This effect is shown in Figure 1.

60151453.000000

5. State the primary purpose of the invention, including the need satisfied or problem solved by the invention:

The purpose of the present invention is to enhance the optical signals that are collected from a microarray either through a unique method of increasing signal collection efficiency, reducing background, or a combination of both. There is a critical need for high sensitivity in the array field for a wide range of assays: for example, high sensitivity can lead to 1) improved accuracy of results, 2) a broader range of assays that can be performed, 3) higher throughput of assays and reduced costs due to less stringent requirements on sample concentration. The present invention may accomplish some of these results by improving the overall sensitivity (lowering the detection limit) of optical microarrays, and increasing the dynamic range of system, allowing quantitation over a larger concentration range.

6. Please list what you feel is the prior art: please include references, articles, talks, abstracts, patents, etc. which are relevant to either the state of the prior art or to the invention. Please include dates and provide copies whenever possible:

Diping Che has done some similar work with other devices – no publications have been made yet, but he has delivered two talks on the subject:

*"A novel surface, attachment chemistry and CCD-based Imaging system for analysis of genomic DNA arrays"* D. Che et. al., Journal of Scanning Microscopies, 21(2), 63-64, 1999.

*"Microarray chip based on comparative genomic hybridization", D. Che, International Business Conference on Massively parallel DNA analysis, San Francisco, August, 1998.*

7. Are there any publications, abstracts, submitted manuscripts, talks, etc. on this work (either already done or in the works)? Please provide details and dates:

'None.

0  
0  
F  
G  
L  
K  
W  
R  
D  
W  
D  
V

600280-08309

8. Compare new and important features of the invention with the prior art, explaining why and how the invention is better:

The present invention applies to patterned substrates, and to microsphere arrays.

9. Please list known competitors or alternate technologies which solve the same problem:

None known.

10. Are there commercial products you envision? Please describe:

This process could easily be incorporated into the manufacturing process of Illumina's Array of Arrays technology. It is likely that there are many other potential applications of this type of signal improvement in other types of optical analytical systems as well.

11. What are the immediate research plans or steps to be taken:

Repetition of experiments, and checking additional fluorescence channels for similar S/N improvements.

12. What are the longer term research plans or steps to be taken:

Other metal films, as well as varying thicknesses, should be explored. Metal coating adhesion to various polymer substrates should be investigated. Imaging systems capable of direct distal-end imaging need to be developed. Sample interface issues will need to be addressed.

13. Earliest date and place invention was conceived, and substance of conception (identify people and records to support date and place, such as notebook numbers and pages):

Invention was first recorded by Todd Dickinson on August 17, 1999, on page 156 of Illumina Lab Notebook 0004 (Todd Dickinson) – idea originally conceived in July, and discussed with Dr. Diping Che in early August.



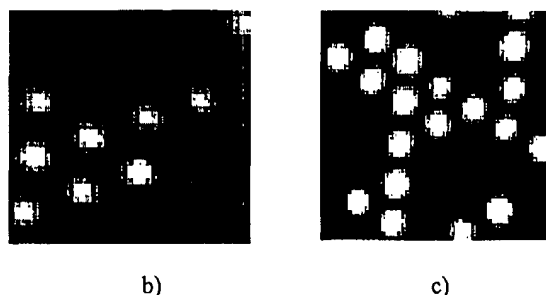


Figure 2. a) A comparison of signals and backgrounds from a single bead type (fluorescein-labelled silica) assembled in a Pd-coated vs. uncoated etched fiber array. Fluorescence image of beads in b) uncoated etched fiber (signal to background of 2.47), and c) Pd-coated etched fiber (signal to background of 28.78).

For this experiment, fluorescein-labelled silica beads were loaded into two different etched fiber bundles: one coated with a thin palladium film (via vapor-deposition), the other uncoated. The average intensities of a subset of beads and empty cores were measured for each fiber and graphed in Figure 2a. The results indicate a substantial reduction in background of the metal-coated fiber as compared to the uncoated fiber, resulting in a 10-fold improvement of the signal-to-background ratio.

These experiments indicate that a) metal films can provide a non-fluorescent, low-background coating for array substrates that improves signal-to-background ratios, and that b) the film does not prevent the immobilization of microspheres into microwell arrays. Furthermore, it is possible that similar metal or other types of coatings could be applied to other substrate materials such as plastics (e.g. polycarbonate, polyamide, polymethyl methacrylate, polysulfone, etc.), silicon, silicones, quartz, and other materials. It is important to note that the ability to lay down a non-fluorescent coating over a patterned substrate material obviates the need to use materials with intrinsically low fluorescence, thus broadening the scope of materials available for generating array platforms.

An added benefit to coating a microarray substrate material may be more efficient signal collection through reflection. Provided an appropriate metal coating is chosen, it is likely that we can harness more of the fluorescence emitted from each bead by creating a reflective surface which can direct fluorescence back toward the detector. There are a wide array of coatings that could prove useful for this application, such as gold, silver, chromium, platinum, and indium tin oxide.

This technique could be used to improve sensitivity of a wide range of assays, including SNP genotyping, small molecule screening, immunoassays, enzymatic assays, and any other chemical or biological assay that can be performed in an optical microarray format.

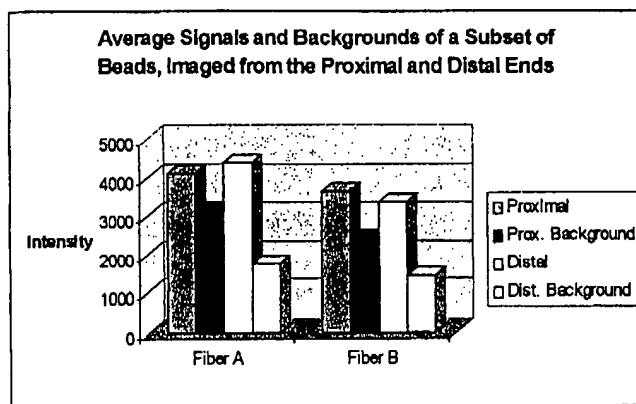


Figure 1.

In this configuration, where one no longer needs to view through the fiber, one could imagine placing a non-fluorescent coating such as a thin metal film over the etched array that blocks the excitation light from hitting the fluorescent substrate underneath, thereby effectively reducing the background of the array. Preliminary experiments indicate that this is indeed possible (Figure 2).

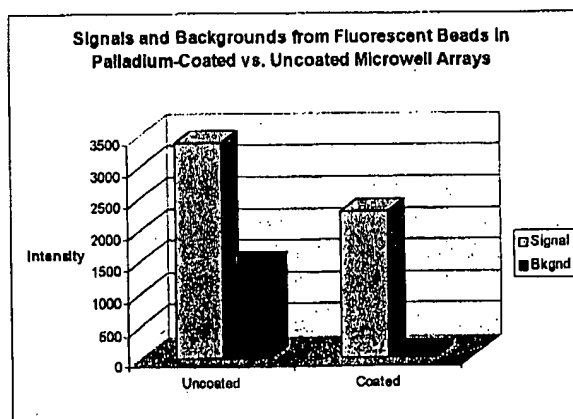
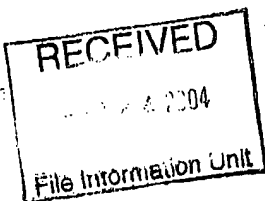


Figure 2a)

# REQUEST FOR ACCESS TO AN ABANDONED APPLICATION UNDER 37 CFR 1.14

Bring completed form to:  
 File Information Unit  
 Crystal Plaza Three, Room 1200  
 2021 South Clark Place  
 Arlington, VA  
 Telephone: (703) 305-2733



In re Application of

Application Number 60/151,483 Filed 10, 30, 00

Paper No. #2

I hereby request access under 37 CFR 1.14(a)(1)(iv) to the application file record of the above identified ABANDONED application, which is identified in, or to which a benefit is claimed, in the following document (as shown in the attachment):

United States Patent Application Publication No. W601/18524, page, \_\_\_\_\_ line \_\_\_\_\_  
 United States Patent Number \_\_\_\_\_, column \_\_\_\_\_, line \_\_\_\_\_ or  
 WIPO Pub. No. \_\_\_\_\_, page \_\_\_\_\_, line \_\_\_\_\_

## Related Information about Access to Pending Applications (37 CFR 1.14):

Direct access to pending applications is not available to the public but copies may be available and may be purchased from the Office of Public Records upon payment of the appropriate fee (37 CFR 1.18(b)), as follows:

For published applications that are still pending, a member of the public may obtain a copy of:

- the file contents;
- the pending application as originally filed; or
- any document in the file of the pending application.

For unpublished applications that are still pending:

- (1) If the benefit of the pending application is claimed under 35 U.S.C. 119(e), 120, 121, or 365 in another application that has: (a) issued as a U.S. patent, or (b) published as a statutory invention registration, a U.S. patent application publication, or an international patent application publication in accordance with PCT Article 21(2), a member of the public may obtain a copy of:

- the file contents;
- the pending application as originally filed; or
- any document in the file of the pending application.

- (2) If the application is incorporated by reference or otherwise identified in a U.S. patent, a statutory invention registration, a U.S. patent application publication, or an international patent application publication in accordance with PCT Article 21(2), a member of the public may obtain a copy of:

- the pending application as originally filed.

Kou Rodriguez

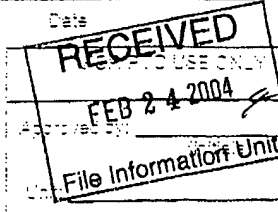
Signature

2/24/04

Date

Kelvin Rodriguez

Typed or printed name



Registration Number, if applicable

(703) 418-2797

Telephone Number

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Approved for use through 7/31/2003. OMB 0551-2031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

# REQUEST FOR ACCESS TO AN ABANDONED APPLICATION UNDER 37 CFR 1.14

Bring completed form to:  
File Information Unit  
Crystal Plaza Three, Room 1001  
2021 South Clark Place  
Arlington, VA  
Telephone: (703) 308-2733

**RECEIVED**  
JUL 10 2006

In re Application of

Application Number

60/157483

Filed

Aug 30, 1999

Paper No. # 3

I hereby request access under 37 CFR 1.14 to the application file record of the above-identified ABANDONED application, which is identified in, or to which benefit is claimed, in the following document (as shown in the attachment):

United States Patent Application Publication No. \_\_\_\_\_, page \_\_\_\_\_, line \_\_\_\_\_.

United States Patent Number 6942968, column \_\_\_\_\_, line \_\_\_\_\_, or

WIPO Pub. No. \_\_\_\_\_, page \_\_\_\_\_, line \_\_\_\_\_.

## Related Information about Access to Pending Applications (37 CFR 1.14):

Direct access to pending applications is not available to the public but copies may be available and may be purchased from the Office of Public Records upon payment of the appropriate fee (37 CFR 1.19(b)), as follows:

- For published applications that are still pending, a member of the public may obtain a copy of:
- the file contents;
  - the pending application as originally filed; or
  - any document in the file of the pending application.
- For unpublished applications that are still pending:
- (1) If the benefit of the pending application is claimed under 35 U.S.C. 119(e), 120, 121, or 365 in another application that has: (a) issued as a U.S. patent, or (b) published as a statutory invention registration, a U.S. patent application publication, or an international patent application publication in accordance with PCT Article 21(2), a member of the public may obtain a copy of:
    - the file contents;
    - the pending application as originally filed; or
    - any document in the file of the pending application.
  - (2) If the application is incorporated by reference or otherwise identified in a U.S. patent, a statutory invention registration, a U.S. patent application publication, or an international patent application publication in accordance with PCT Article 21(2), a member of the public may obtain a copy of:
    - the pending application as originally filed.

*Stamer*

Signature

SAM FUNE'S

Typed or printed name

Registration Number, if applicable

703-413-3667

Telephone Number

7.10.06

Date

FOR PTO USE ONLY

Approved by:

**RECEIVED**  
(Initials)  
JUL 10 2006

Unit

du

File Information Unit

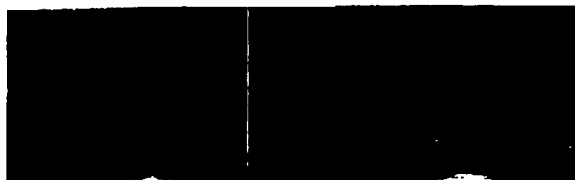
POSITION		ID NO.	DATE
CLASSIFIER			
EXAMINER			
TYPIST			
VERIFIER		7062	9/13/96
CORPS CORR.			
SPEC. HAND			
FILE MAINT			
DRAFTING			

69/15168



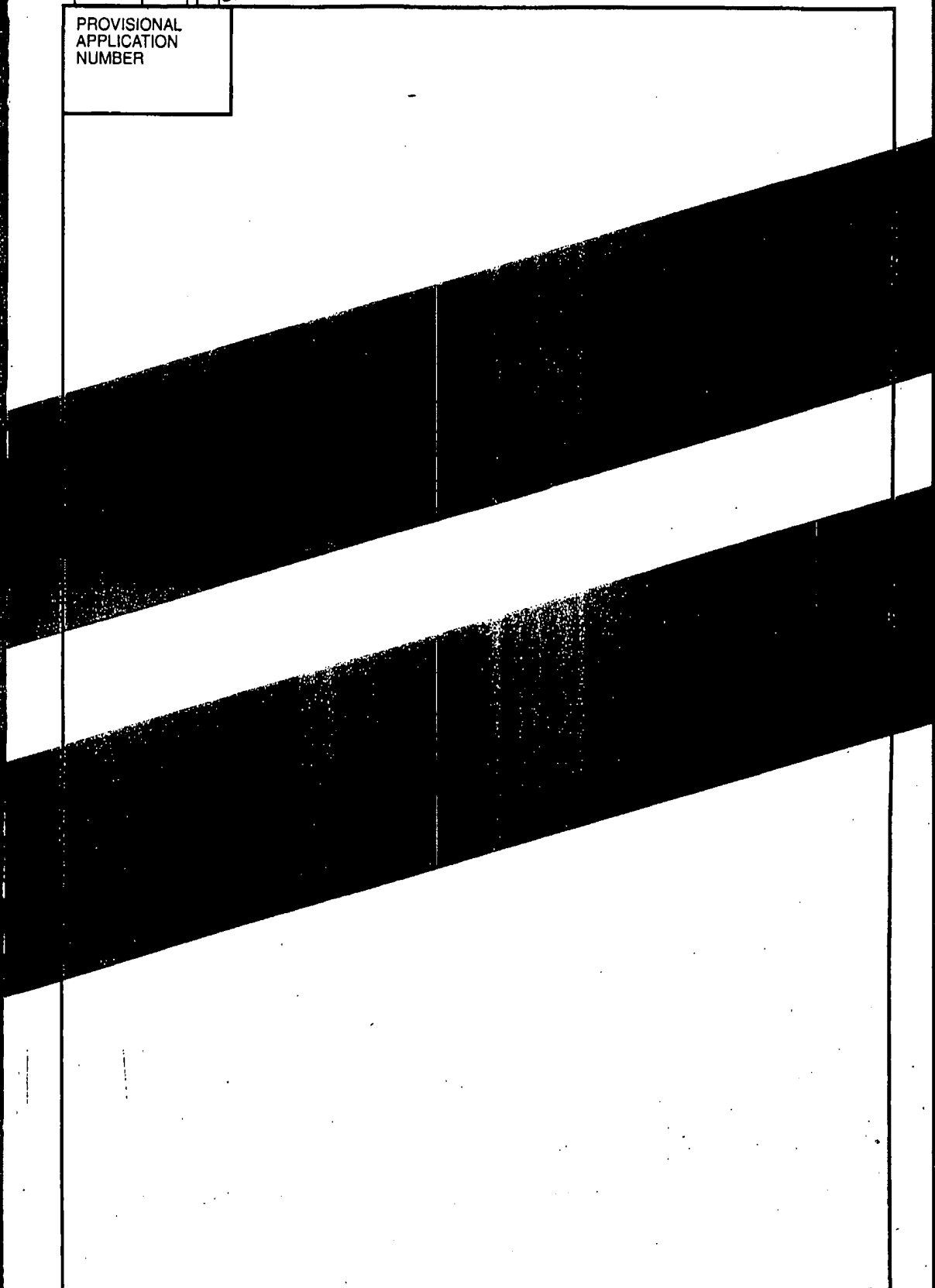
Class	Subclass

ISSUE CLASSIFICATION  
SCANNED 2



2

PROVISIONAL  
APPLICATION  
NUMBER



15168  
10 0 00

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record.**

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☒ **BLACK BORDERS**

☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**

☐ **FADED TEXT OR DRAWING**

☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☐ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**